# Trihalomethane Occurrence and Formation Within Water Distribution Systems in Public Schools

Theobald, Elizabeth (School: Archbold High School)

Trihalomethanes (THM) are cancer group B, EPA-regulated disinfectant byproducts of chlorine-treated water. A survey of Fulton County, OH public school districts supplied by surface water containing high levels of organic compounds was completed. It was hypothesized that school THM levels could be predicted by source water Consumer Confidence Reports (CCR), and timed runs of tap water following periods of school nonuse would decrease THMs. Increased water temperature and time were hypothesized to cause rising THM and decreasing chlorine levels with copper and PEX-C materials not significantly impacting THMs. Sixty-six point of use water samples were collected from school buildings representing eight districts. Thirty-six additional samples evaluated the effects of temperature, time and materials in the water distribution systems (WDS). Temperature, free and total chlorine using the Hach colorimeter DPD method, and THM levels using the Parker THM Analyzer employing purge-and-trap gas chromatography were measured. Results indicate CCRs can predict school THM levels. Timed tap water runs were an ineffective measure to reduce THMs. Increased distance of schools from the source water correlated with rising THMs. Increased temperature led to increased TTHM ($p=0.0108$), chloroform ($p=0.0010$), and bromoform ($p=0.0009$) with decreased free ($p=0.0033$) and total chlorine ($p=0.0025$). Over time, chlorine decayed in all samples. Water held at 5 degrees C and 50 degrees C demonstrated rising THM levels in the initial 48 hours. Thereafter, THMs decreased in the 50 degrees C samples and continued to rise in the 5 degrees C samples. By identifying these WDS characteristics and schools benefiting from mitigation strategies, student lifetime exposure can be minimized.

**Awards Won:**